

PATENT SPECIFICATION

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DRAWINGS ATTACHED

- (21) Application No. 34497/69 (22) Filed 9 July 1969
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(54) FILTER PRESS PLATES

(71) We, DAVID MOSELEY & SONS LIMITED, a British Company of Mancunian Way, Ardwick, Manchester 12, Lancashire, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to plates for filter presses and more particularly for filter presses for producing a filter cake from particulate suspensions having a low moisture content.

According to the present invention an asymmetric plate for a filter press comprises a rigid or substantially rigid body part, a recess in one face of the body part, a flexible membrane extending across the said recess and defining a closed chamber between the body part and membrane, the said membrane being applied to the body part in sealed relationship therewith, an inlet to the said chamber, and outwardly open drainage channels or like formations in the

medium the section being taken on line IV—IV of Fig. 1; and

Fig. 5 is a cross section on line V—V of Fig. 4; and

And with reference to the accompanying drawings wherein:—

Fig. 6 is a plan view, partly broken away, of a filter plate stack;

Fig. 7 is a section, drawn to an enlarged scale, on line VII—VII of Fig. 6;

Fig. 8 is a similar section on line VIII—VIII of Fig. 6; and

Fig. 9 is a similar section on line IX—IX of Fig. 6

Referring now to the drawings and in particular to Figs. 1 to 5 thereof which illustrate the invention schematically, two pressing chambers 1 and 2 of a filter press each have a flexible membrane 3 secured therein. In Fig. 1 the flexible membrane of chamber 1 is shown in the position it occupies before the pressing operation, whilst the

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By a direction given under Section 17 (1) of the Patents Act 1949 this application proceeded in the name of THE MOSELEY RUBBER COMPANY LIMITED, a British Company, of Mancunian Way, Ardwick, Manchester, Lancashire.

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THE PATENT OFFICE

reference to the drawings filed with the provisional specification wherein:—

Fig. 1 shows a schematic cross sectional view of two chambers of a filter press embodying press plates constructed in accordance with the invention;

Fig. 2 is a section taken on line II—II of Fig. 1 and shows a flexible membrane with the filter medium applied thereto;

Fig. 3 is a section taken on line III—III of Fig. 2;

Fig. 4 is a view corresponding to Fig. 2 of a ridged plate and superimposed filter

medium ribs 4 formed integrally therewith, and a filtering material 5 abuts the free ends of the ribs thereby to form a series of channels 6 between the membrane 3 and filtering material 5, as shown in Fig. 3.

The sides 7 of the pressing chambers facing the filtering material 5 of the membranes are also provided with ribs 8, a similar filtering material 9 being provided against such ribs and forming a series of channels 10 (Fig. 4). Such an arrangement presents a rigid surface for each chamber.

Suspension inlet pipes 11 connect the tops of the chambers with a suspension supply pipe 12, the inlet pipes leading into those

SPECIFICATION AMENDED—SEE ATTACHED SLIP

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(54) FILTER PRESS PLATES

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The present invention relates to plates for filter presses and more particularly for filter presses for producing a filter cake from particulate suspensions having a low moisture content.

According to the present invention an asymmetric plate for a filter press comprises a rigid or substantially rigid body part, a recess in one face of the body part, a flexible membrane extending across the said recess and defining a closed chamber between the body part and membrane, the said membrane being applied to the body part in sealed relationship therewith, an inlet to the said chamber, and outwardly open drainage channels or like formations in the other face of the body part the filter plate being adapted to co-operate with a similar plate arranged in like adjacent disposition to define a filter chamber between that face of the body part having the drainage channels or like formations and the adjacent outer face of the membrane of the next plate.

The invention also includes a filter press including a filter plate as aforesaid.

An embodiment of the invention will now be described by way of example only, with reference to the drawings filed with the provisional specification wherein:—

Fig. 1 shows a schematic cross sectional view of two chambers of a filter press embodying press plates constructed in accordance with the invention;

Fig. 2 is a section taken on line II—II of Fig. 1 and shows a flexible membrane with the filter medium applied thereto;

Fig. 3 is a section taken on line III—III of Fig. 2;

Fig. 4 is a view corresponding to Fig. 2 of a ridged plate, and superimposed filter

medium the section being taken on line IV—IV of Fig. 1; and

Fig. 5 is a cross section on line V—V of Fig. 4; and

And with reference to the accompanying drawings wherein:—

Fig. 6 is a plan view, partly broken away, of a filter plate stack;

Fig. 7 is a section, drawn to an enlarged scale, on line VII—VII of Fig. 6;

Fig. 8 is a similar section on line VIII—VIII of Fig. 6; and

Fig. 9 is a similar section on line IX—IX of Fig. 6

Referring now to the drawings and in particular to Figs. 1 to 5 thereof which illustrate the invention schematically, two pressing chambers 1 and 2 of a filter press each have a flexible membrane 3 secured therein. In Fig. 1 the flexible membrane of chamber 1 is shown in the position it occupies before the pressing operation, whilst the membrane of chamber 2 is shown in the position it occupies after the pressing operation. It is to be appreciated that the chambers have been so represented only for illustrative purposes, and under normal operating conditions the pressing process is carried out simultaneously in all chambers. It should further be mentioned that although only two pressing chambers are illustrated, in practice the filter press will have a series of such chambers.

The membranes 3 may have a series of longitudinal ribs 4 formed integrally therewith, and a filtering material 5 abuts the free ends of the ribs thereby to form a series of channels 6 between the membrane 3 and filtering material 5, as shown in Fig. 3.

The sides 7 of the pressing chambers facing the filtering material 5 of the membranes are also provided with ribs 8, a similar filtering material 9 being provided against such ribs and forming a series of channels 10 (Fig. 4). Such an arrangement presents a rigid surface for each chamber.

Suspension inlet pipes 11 connect the tops of the chambers with a suspension supply pipe 12, the inlet pipes leading into those

SPECIFICATION AMENDED - SEE ATTACHED SLIP

volumes 13 of the chambers between the flexible membranes 3 and the opposed rigid faces 7 of the filter plate, whilst air inlet pipes 14 connect the remaining volumes 15 of the chambers to an air supply pipe 16.

Liquid outlet ducts 17 and 18 are provided at the base of the chambers, and join with an outlet pipe 19, ducts 17 connecting with channels 6 and ducts 18 connecting with channels 10.

The pressing chambers are formed from two separate elements between which the membranes 3 are located, each membrane being bonded to one of the said elements, and the volume of the chambers being increased by providing spacing-frames (not shown) between the elements of each pair. The series of chambers are held together and consolidated by pressure exerted between two end plates (not shown).

In operation, a particulate suspension is introduced into the chambers through the suspension supply pipe 12, and the inlet pipes 11, such that the volumes 13 of the chambers are completely filled with the suspension. At this stage normal press filtration is allowed to occur until the filtration rate has fallen to a predetermined low level whereupon compressed air is then fed into volumes 15 of the chambers through the air supply pipe 16 and air inlet pipes 14. Thus, under pressure from the compressed air, the flexible membrane 3 is caused to deflect, to compress the suspension between the membrane and the filter plate.

Compression of the suspension as aforesaid causes liquid remaining in the suspension to seep through the filtering material on the filter plates and membranes into the channels 6 and 10, to drain to the outlet ducts 17 and 18 and be removed through outlet pipe 19.

The compression is continued until the liquid content of the suspension in any given chamber reaches a constant level, and a filter cake, comprising compressed solid matter, is formed between the sheets of filtering material overlying the membrane and the aforesaid rigid surface of the filter plate.

On completion of the compression, the air pressure is relieved by opening a release valve, (not shown), and the chambers 13 are opened by separating the aforesaid elements and the filter cake removed.

Referring now to Figs. 6 to 9 of the drawings which illustrate a material form of press plate in detail, a filter press comprises a plurality of similar asymmetric filter plate 61, arranged in like disposition upon a framework (not shown), appropriate filter materials 64 being interposed between successive such plates and the said plates being held together under pressure in conventional manner.

The filter plates 61 each comprise a rectangular body having a generally frusto-pyramidal recess 61a in each opposite face thereof,

and a membrane 62 bonded to the body and extending across one of the recesses to close the same. A flat 61b extends about the periphery of the plate at each face thereof for co-operation with a corresponding flat of an adjacent plate. The plates are conveniently moulded from a rubber or like material and will usually include a reinforcing plate 61c symmetrically arranged therein and moulded integrally therewith.

The floor of that recess which is open outwardly of the plate, which recess is to form the press chamber, is provided with a multiplicity of upstanding ribs 61d and cylindrical protruberances 61e, such ribs and protruberances being arranged in rows extending diagonally of the plate to define drainage passages 61f (Fig. 6) therebetween. The drainage passages 61f are connected with an outlet channel 61g provided in the flat 61b by generally L-shaped passages 61h, such passages 61h extending from the floor of the recess at one end thereof to enter the channel 61g from below. The channel 61g is connected at one end thereof with a drainage port 61j provided at a corner of the plate, the said port being in register with similar ports in the adjacent plates.

The plate also includes a material inlet port 61k through which a suspension is fed to the press chamber, and further includes an air inlet port 61l through which air is applied to the recess between the membrane 62 and the plate to which such membrane is bonded.

The outer face of the membrane 62 is ribbed, as at 62a to define drainage channels 62b, such channels terminating in a common gulley 62c formed in the surface of the membrane adjacent an edge thereof and connected with drainage port 61j by passageway 62d. In the region of feed port 61k the plate body is slightly dished as at 61n, thereby to define an inlet opening whereby suspension to be treated passes from the inlet port to the chamber defined by and between a membrane on one plate and the floor of the recess of the next adjacent plate.

Air inlet port 61l is connected with air space 63 defined by and between the inner face of the membrane 62 and the floor of the recess in the plate to which the membrane is bonded by through passages 61m provided in the plate body.

The filter materials 64 will be of any convenient kind, and a layer thereof will be provided at that face of plate 61 having the protruberances thereto and also at the ribbed face of the membrane 62.

In practice a plurality of filter plates 61 are arranged in superimposed dispositions, filter material being positioned between successive such plates.

Material to be filtered is introduced into the press chamber 65 between the membrane 62 and the floor of adjacent filter plate, and

on introduction of pressure air or fluid into the space 63 behind the membrane, the liquid present in the material to be filtered is expressed through the filter material, there being a layer of such material against the surface of each of the opposed elements through which the liquor passes in moving to channel 61g or gulley 62c.

Although we prefer to use a flexible membrane fabricated from rubber, it may also be made from cross-linked or uncross-linked polymeric or resinous materials reinforced with one or more of such reinforcing materials as carbon fibres and fabric, asbestos fibres and fabric, glass, steel cord, silicon carbide whiskers or polymeric fibres, and the side wall of the chamber supporting the filtering material may be of steel of a suitable design, polymeric materials alone, polymeric or resinous materials reinforced with one or more of the aforesaid reinforcing materials excluding steel cord but including glass fibres or plywood coated with any one of the aforesaid combinations of polymeric or resinous materials with reinforcing materials.

Furthermore the invention is in no way limited to the use of ribs or grooves in providing a drainage system for the membrane or filter plate. Thus, for example, the filtering material may be supported by a plurality of truncated cones, truncated pyramids or similar protruberances attached to or formed integrally with the surface of the membrane or of the side wall of the pressing chamber.

Such a filter press has the advantage that compared with heretofore known presses of a similar type, only one flexible membrane is used in each pressing chamber, thus mitigating the disadvantages caused by wearing of the membranes, and reducing the cost of the press.

It will be appreciated that the exact features of the embodiment hereinbefore described in now way limits the invention since alternatives will readily present themselves to one skilled in the art. Thus, for example, instead of using a separate filtering material in conjunction with the membrane, the latter may comprise a single element having a filtering medium bonded thereto. In another alternative, water or any other suitable fluid pressure may be used in applying the compression to the suspension.

WHAT WE CLAIM IS:—

1. An asymmetric plate for a filter press, the plate comprising a rigid or substantially rigid body part, a recess in one face of the body part, a flexible membrane extending across the said recess and defining a closed

chamber between the body part and membrane, the said membrane being applied to the body part in sealed relationship therewith, an inlet to the said chamber, and outwardly open drainage channels or like formations in the other face of the body part, the filter plate being adapted to co-operate with a similar plate arranged in like adjacent disposition to define a filter chamber between that face of the body part having the drainage channels or like formations and the adjacent outer face of the membrane of the next plate.

2. A filter press plate as claimed in claim 1, wherein both faces of the body part are formed with a recess.

3. A filter press plate as claimed in either one of the preceding claims wherein the outer face of the membrane is provided with drainage channels or like formations.

4. A filter press plate as claimed in claim 3, wherein the drainage channels or the like in the outer face of the membrane are connected with a common gulley.

5. A filter press plate as claimed in any one of the preceding claims wherein ports are provided at corners of such plate, one such port being connected with the space between a membrane and the plate to which it is applied, another port being connected with the said other face of the body part for drainage purposes, and a third port being connected with the outer face of the membrane for feed purposes.

6. A filter press plate as claimed in any one of the preceding claims including a reinforcing plate formed integrally with the body part.

7. A filter press plate as claimed in any one of the preceding claims wherein such plate is of moulded construction.

8. A filter press including a plurality of filter press plates as claimed in any one of the preceding claims arranged in corresponding side-by-side relationship.

9. A filter press plate substantially as hereinbefore described with reference to and as illustrated in the drawing filed with the provisional specification.

10. A filter press plate substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

11. A filter press including a filter press plate as claimed in any one of the preceding claims 1 to 7 and 9 to 10.

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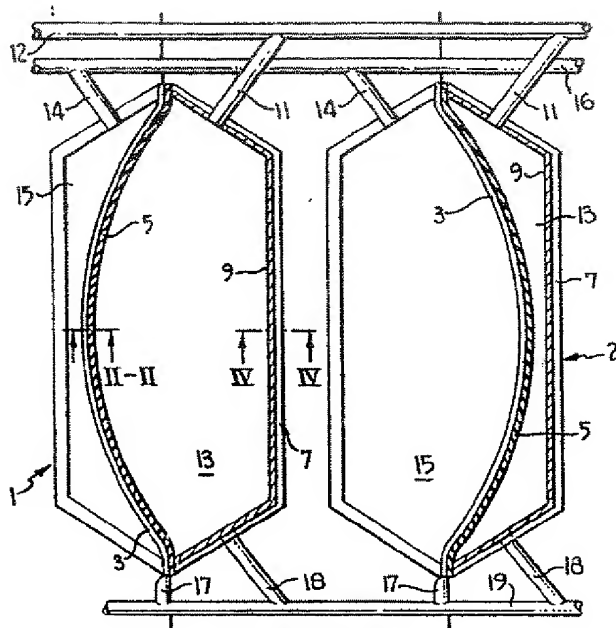


FIG. 1

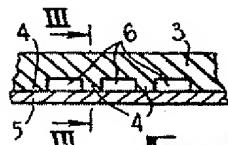


FIG. 2

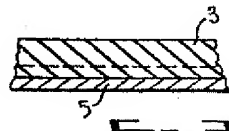


FIG. 3

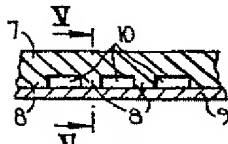


FIG. 4

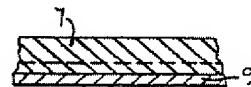


FIG. 5

